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(54) MODULAR POWER LINE FOR AN ELECTRIC VEHICLE

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(51) **Int. Cl.**[7] **B60M 1/00**
(52) **U.S. Cl.** **191/18**
(58) **Field of Search** .... 191/2, 6, 12 R, 191/14, 16, 17, 18, 19, 22 R, 23 R

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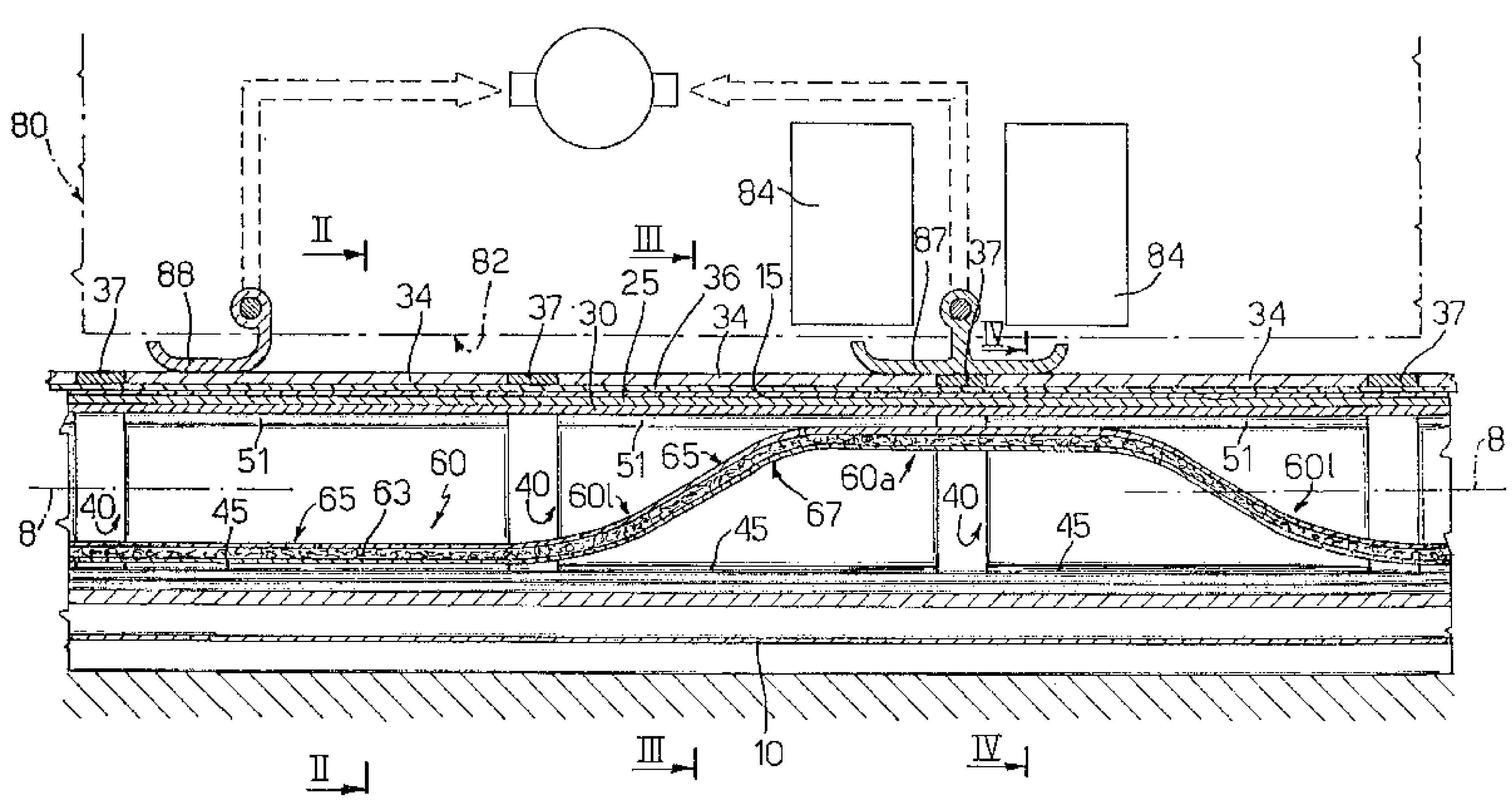
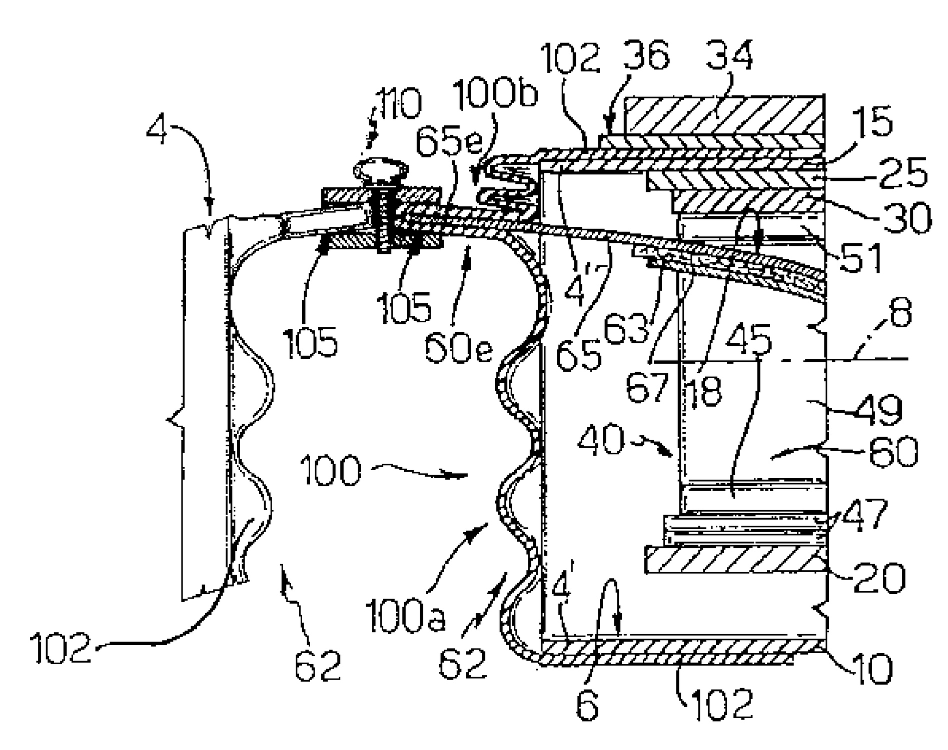
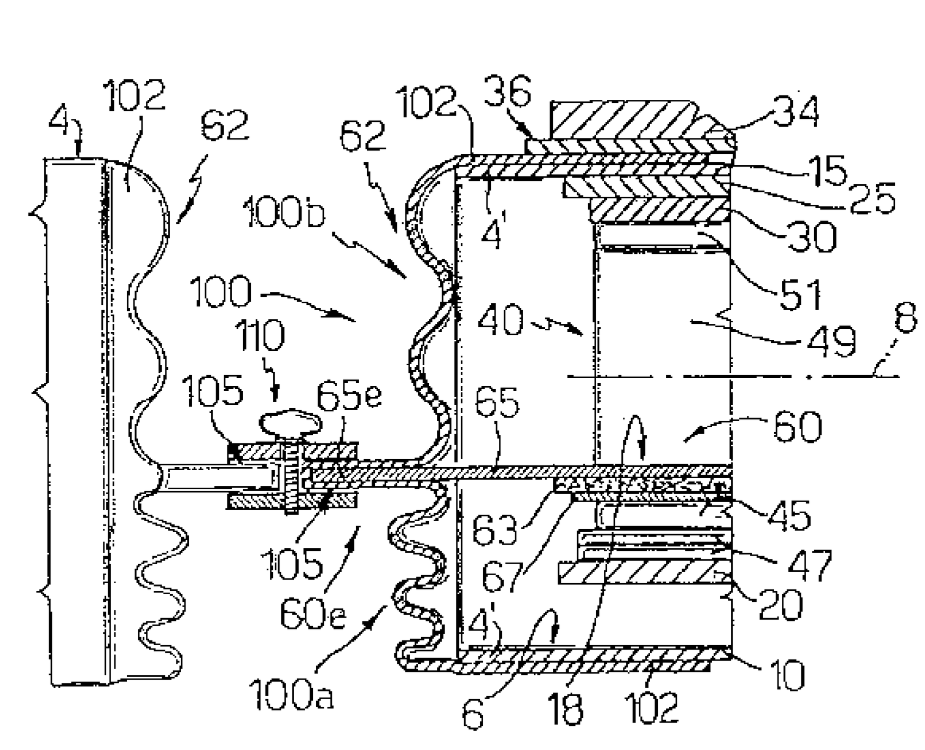
(57) **ABSTRACT**

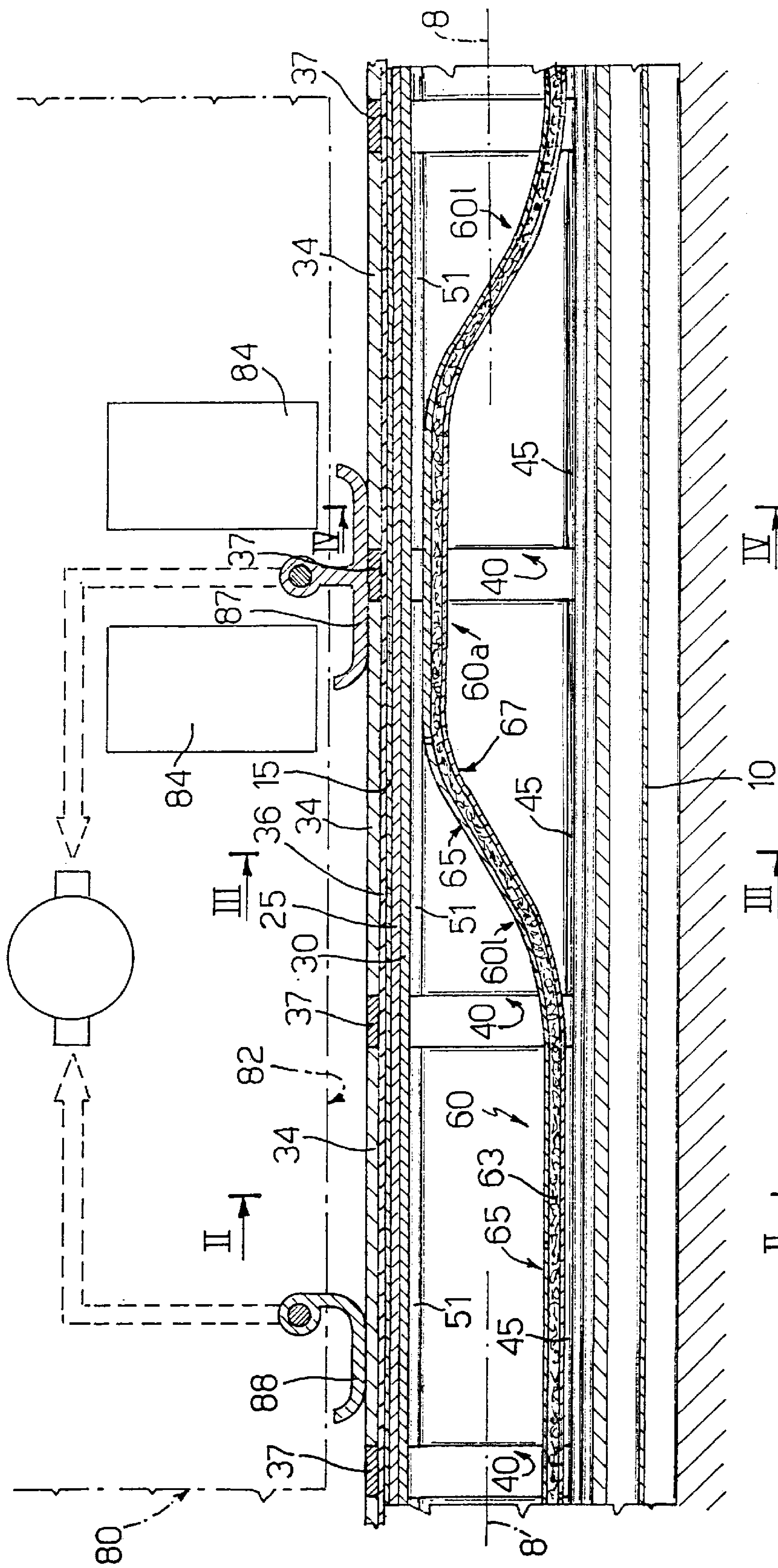
A modular power line (**1**) defined by a number of elongated enclosures (**4**), each housing a conducting line (**27**) and an elastically deformable strip element (**60**) of finite length, which interacts with a magnetic field generated by an electric vehicle (**80**) to attract a portion (**60***a*) of the strip element (**60**) into a contact position in which an electric connection is established between the conducting line (**27**) and at least one power plate (**34**) outside the enclosure (**4**). The enclosure carries, at each end, a supporting device (**62**) for supporting an end portion (**60***e*) of the strip element (**60**) and permitting movement of the end portion (**60***e*) with respect to the enclosure. The supporting device (**62**) also provides for connecting adjacent end portions (**60***e*) of strip elements (**60**) housed in different enclosures (**4**).

17 Claims, 8 Drawing Sheets





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25
51
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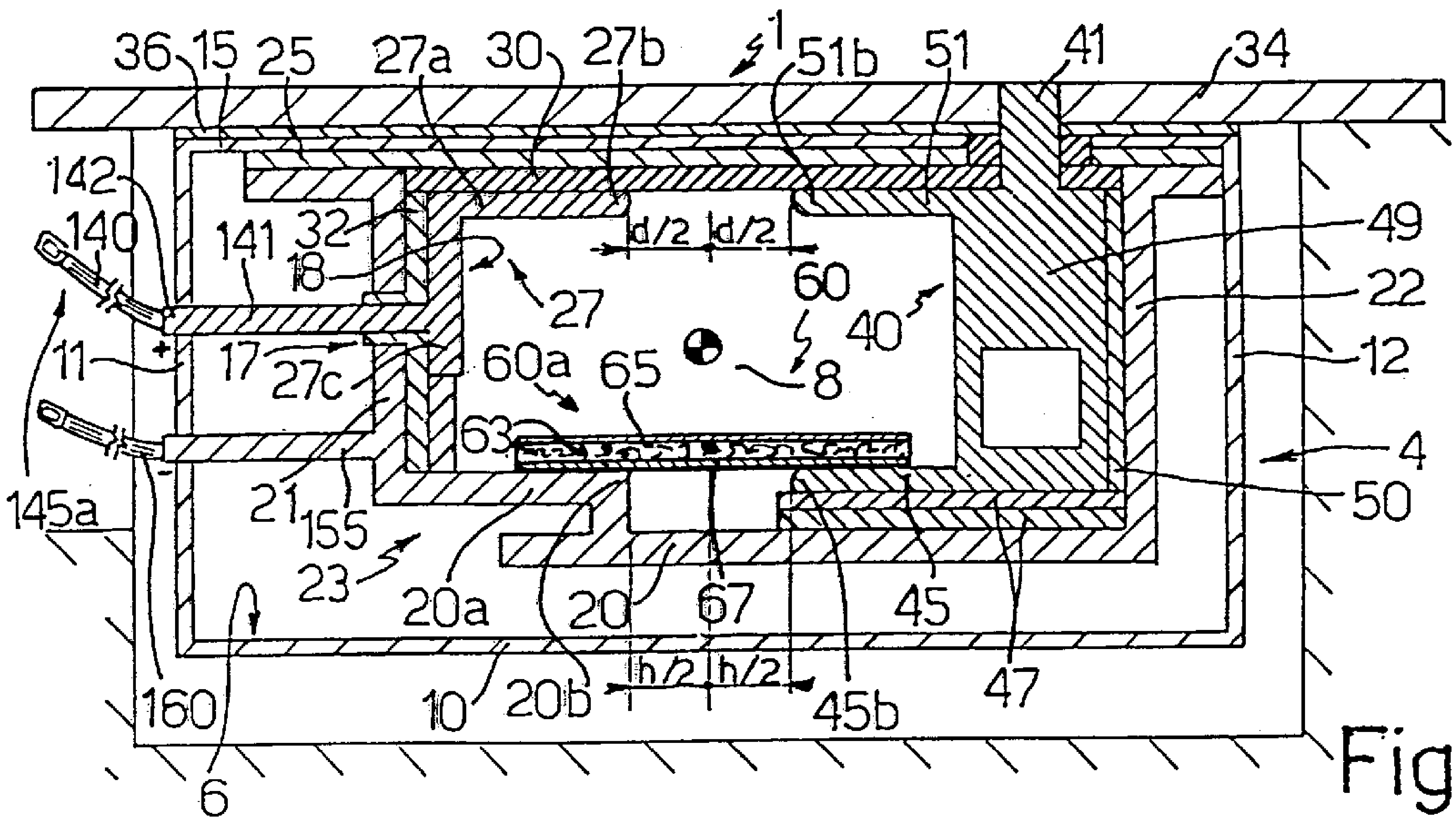
65
51
45
88
37
40
80
8

Fig. 1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60
27
40
22
11
17
27c
60a
65
8
12
63
4
21
155
145a
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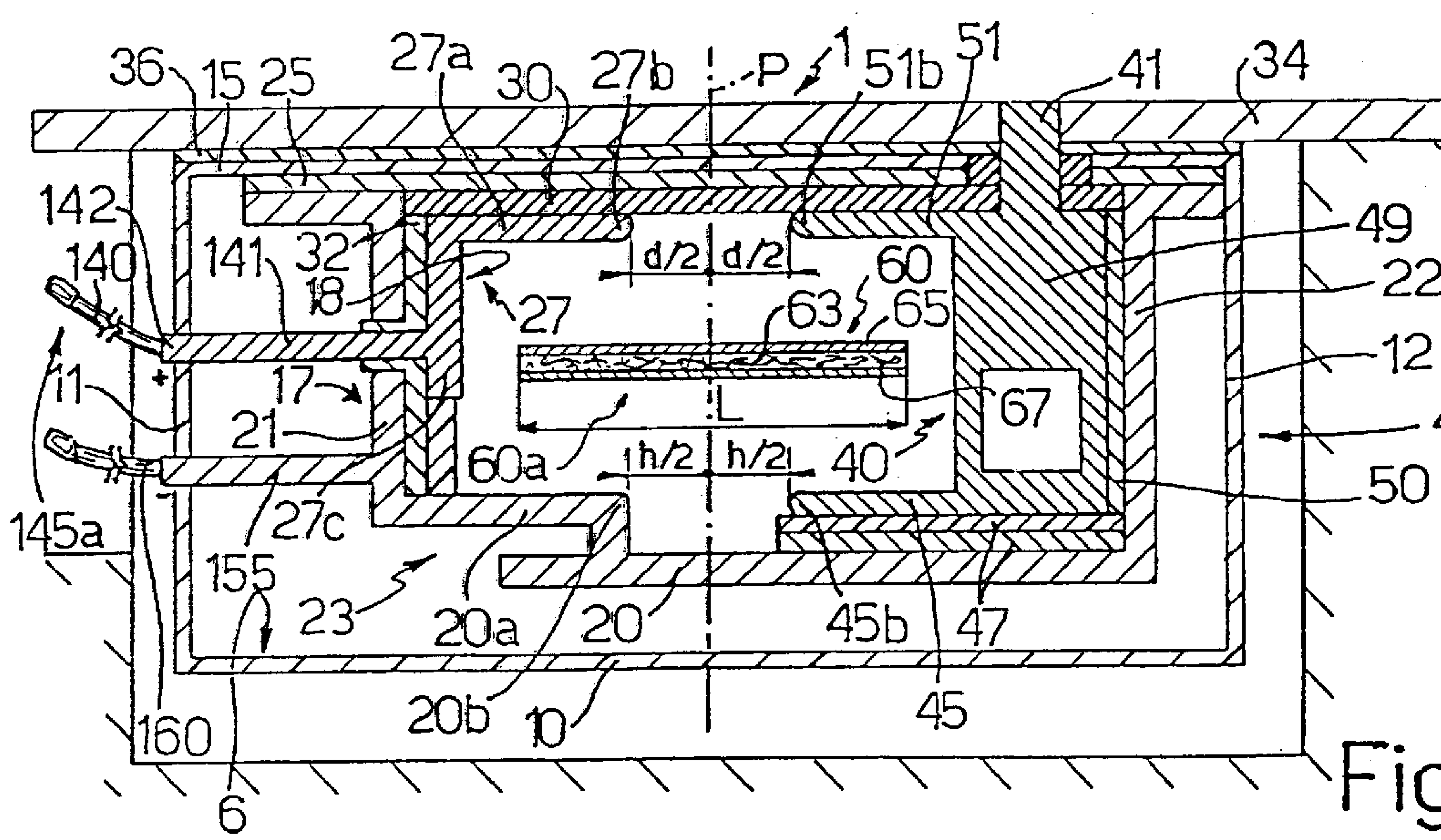
50
23
20a
20
67
47
160
10
20b
h/2
h/2
45b
6

Fig.2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63
65
22
12
11
17
21
L
67
60a
h/2
h/2
40
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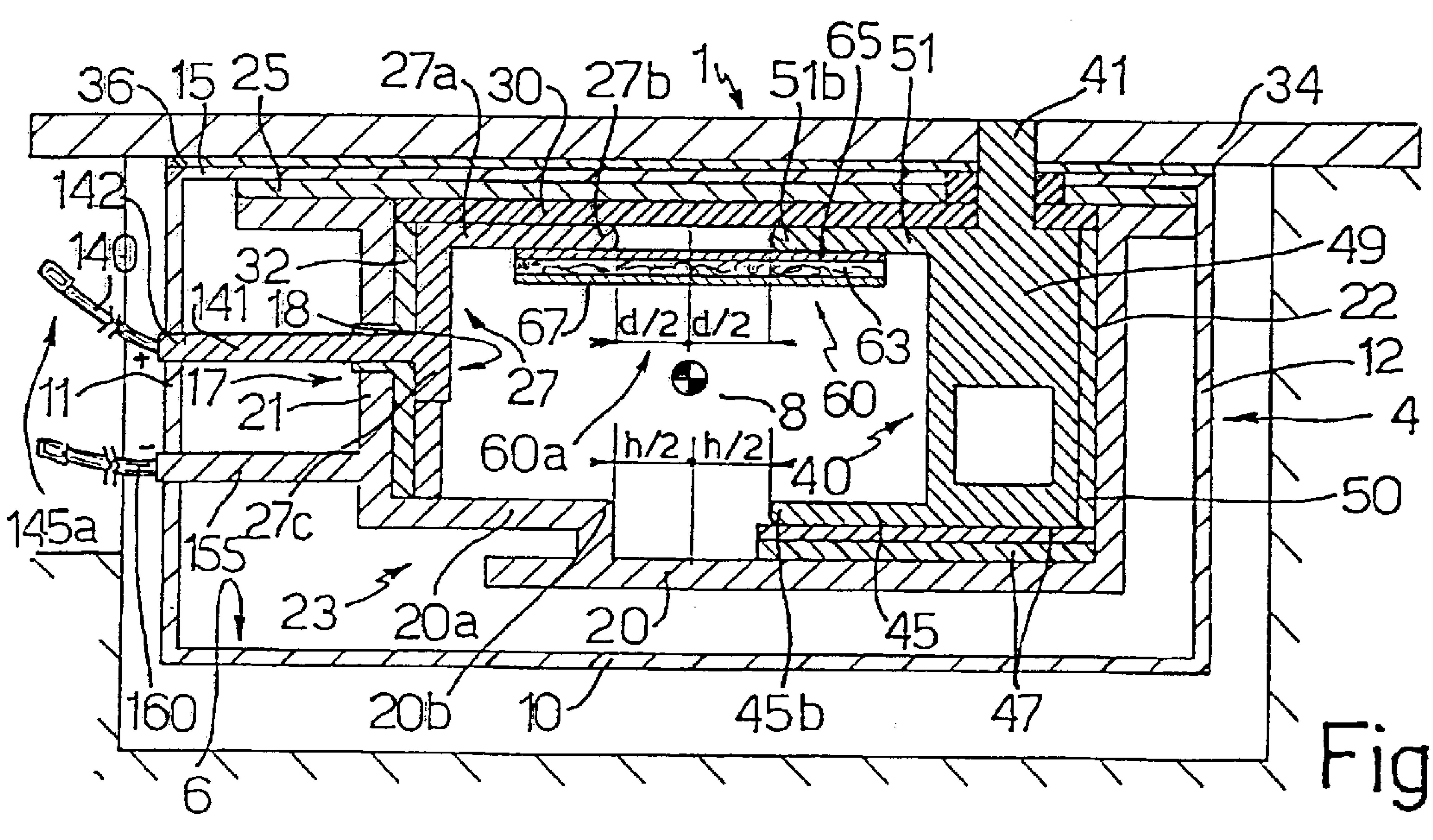
155
23
20a
20
45b
47
160
20b
10
45
6

Fig.3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49
22
12
141
+
11
17
21
27
60
8
4
-
60a
h/2
h/2
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23
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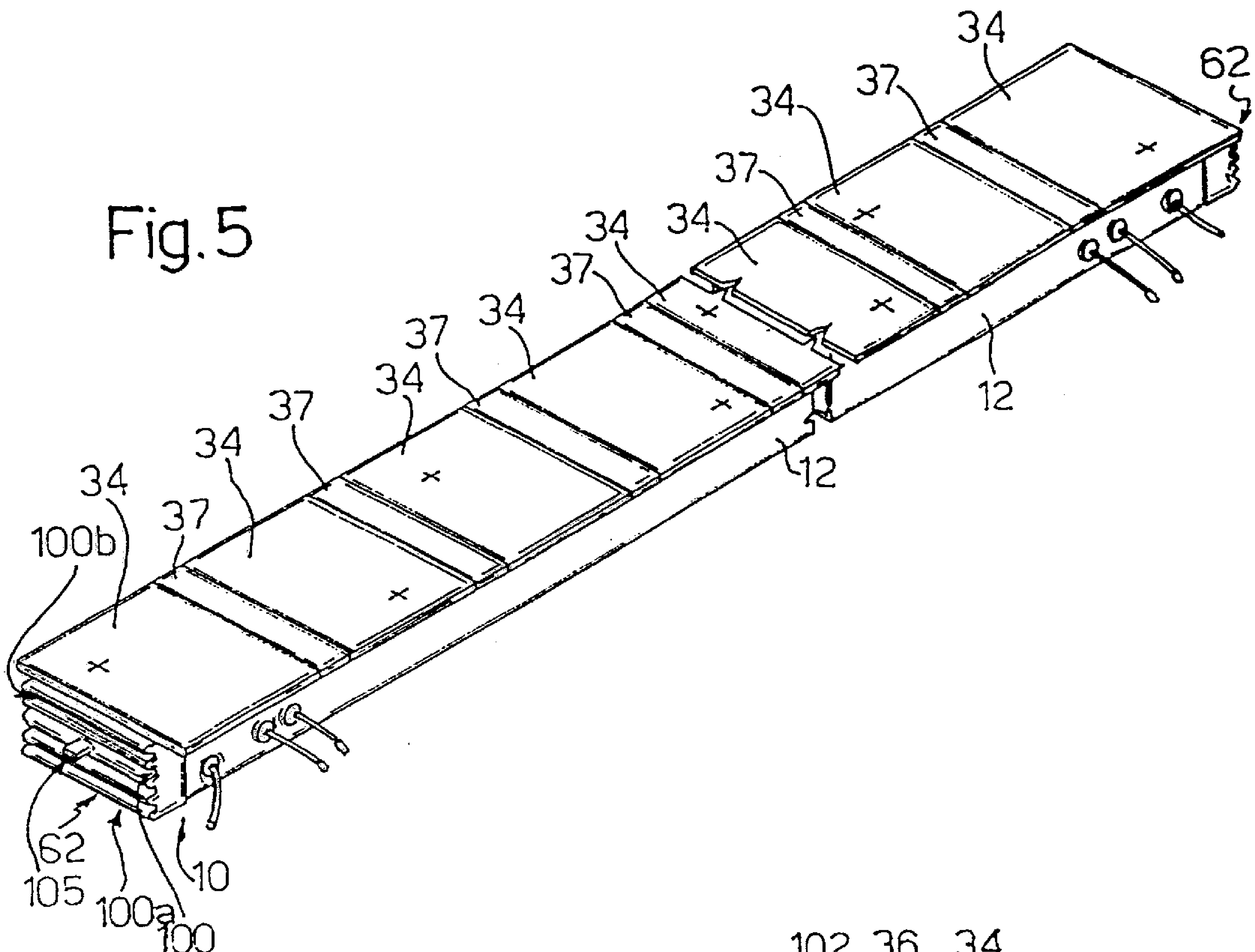
45b
47
6

Fig. 4

Fig.5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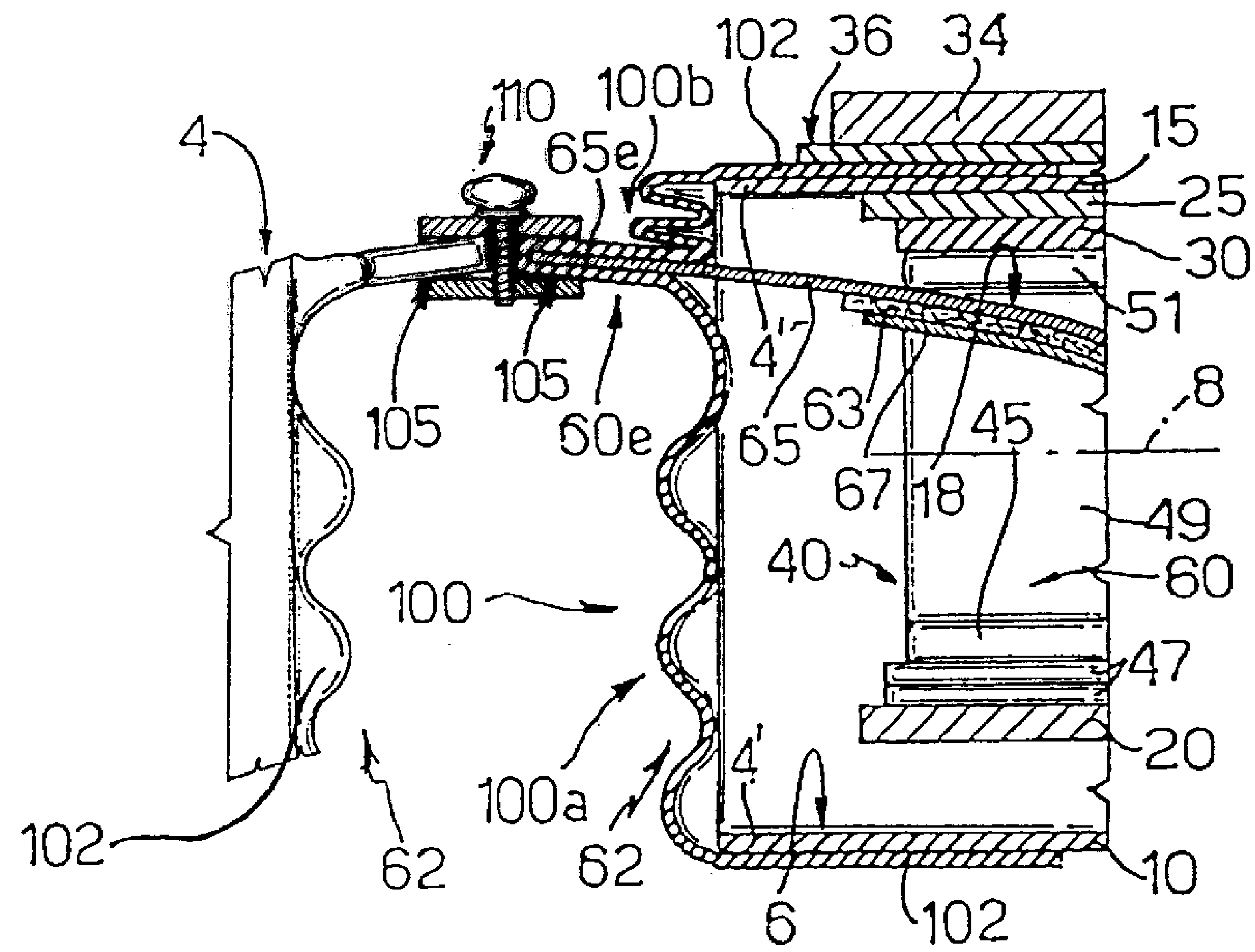
100a
100
10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110
100b
15
4
65e
25
30
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4'
105
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60e
65
63
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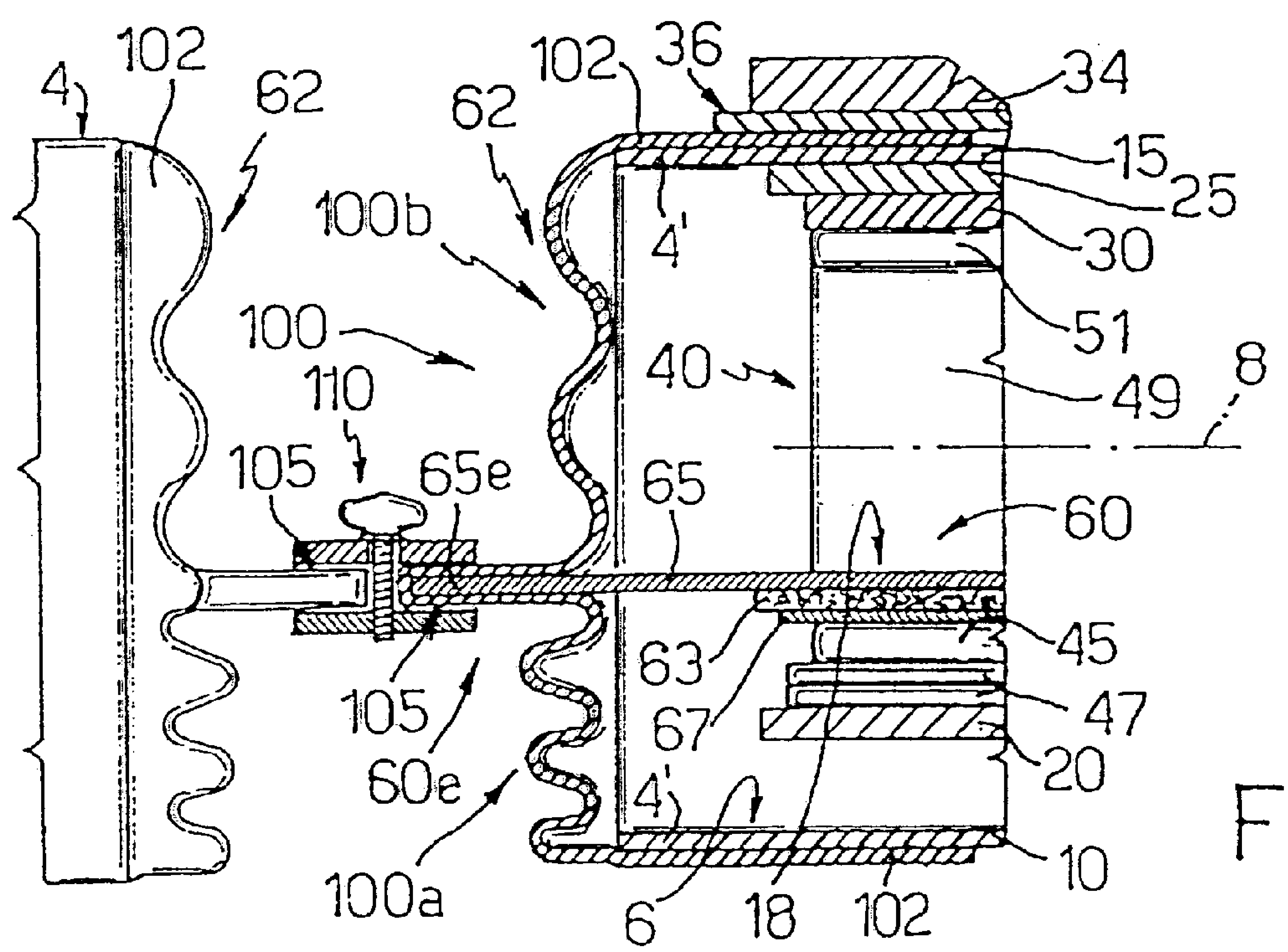
45
67
18
49
40
60
100
47
20
4'
100a
102
62
62
6
102
10

Fig.6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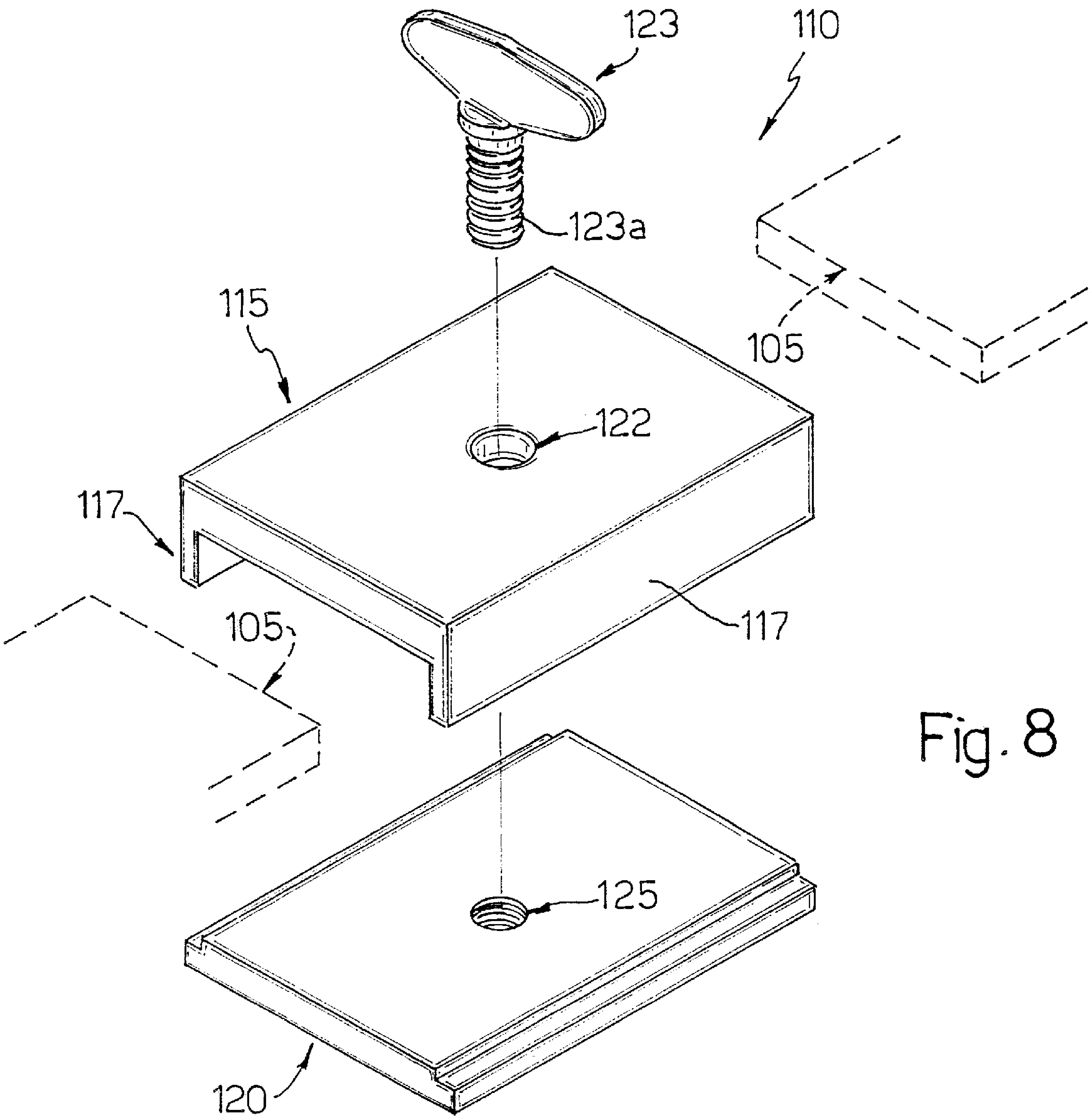
67
47
20
60e
4'
100a
6
18
102
10

Fig.7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105
125
120

Fig. 8

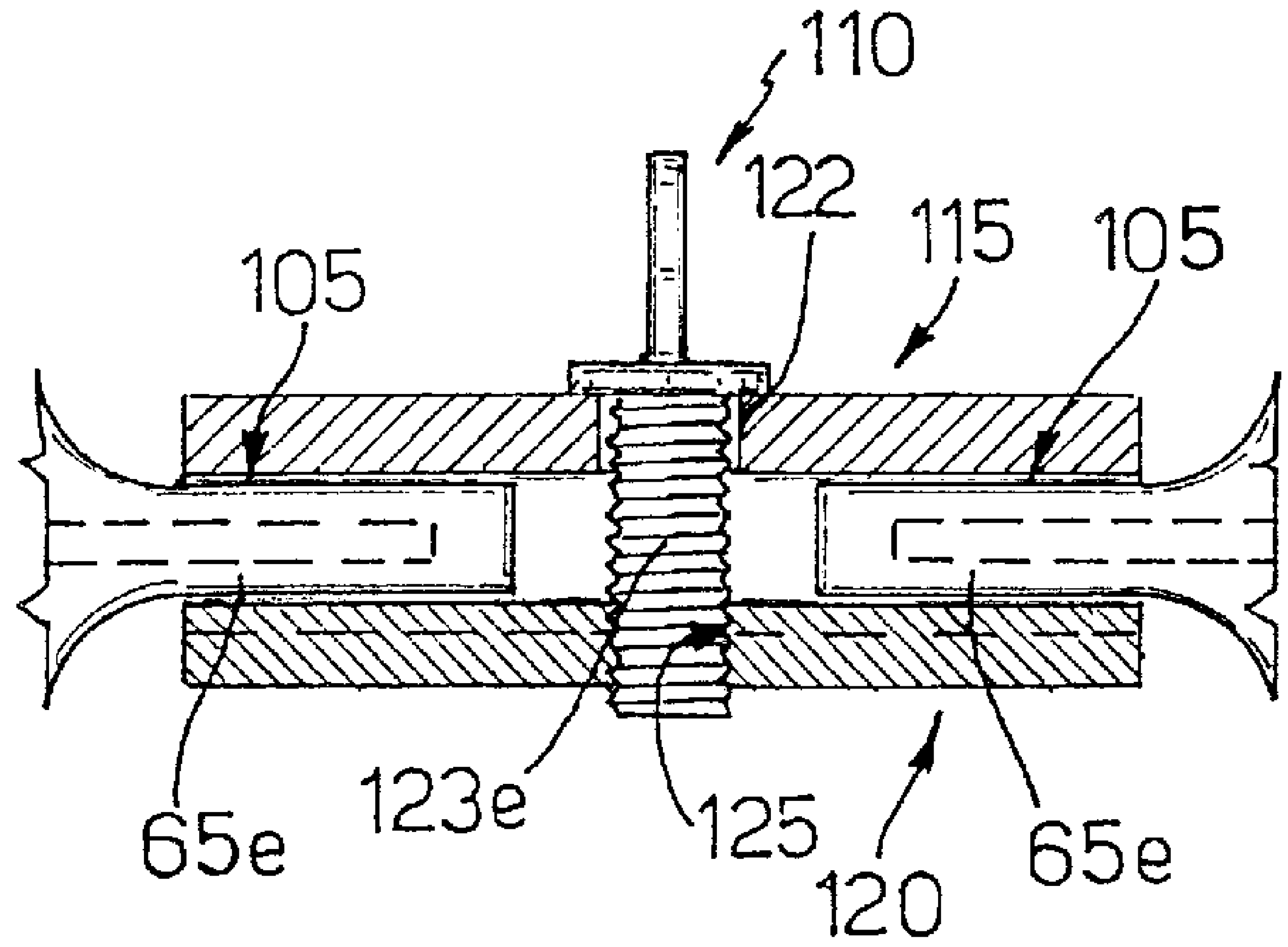
110
122
115
105
105
65e
123e
125
120
65e

Fig.9

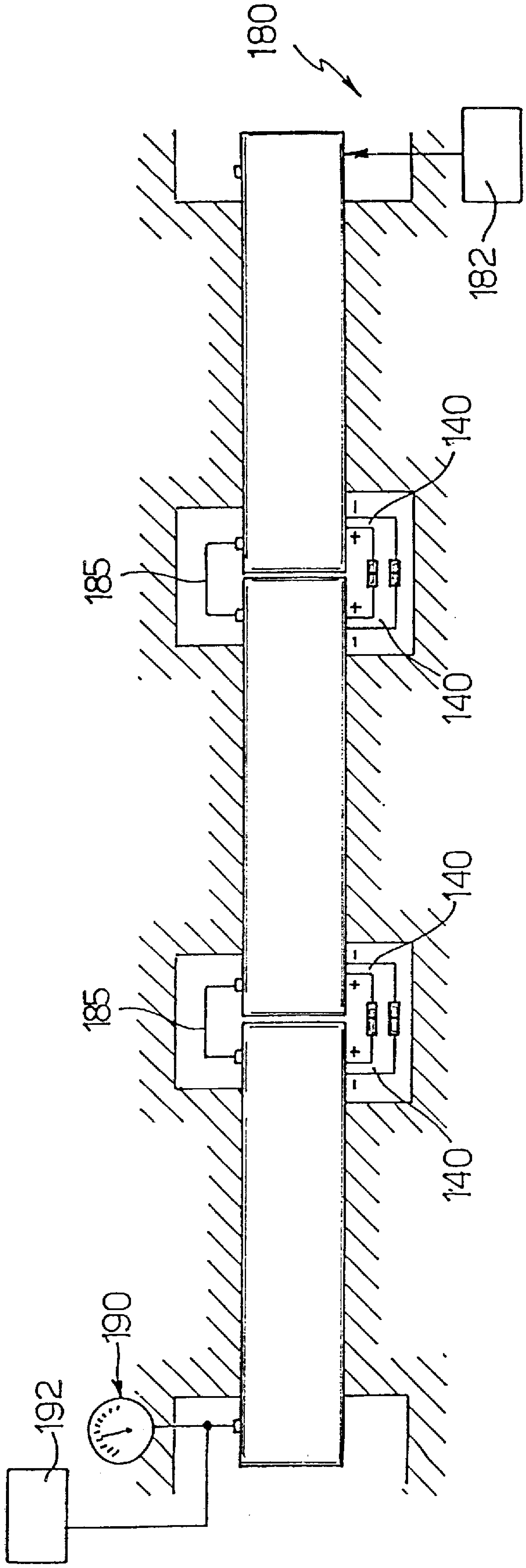

Fig.10

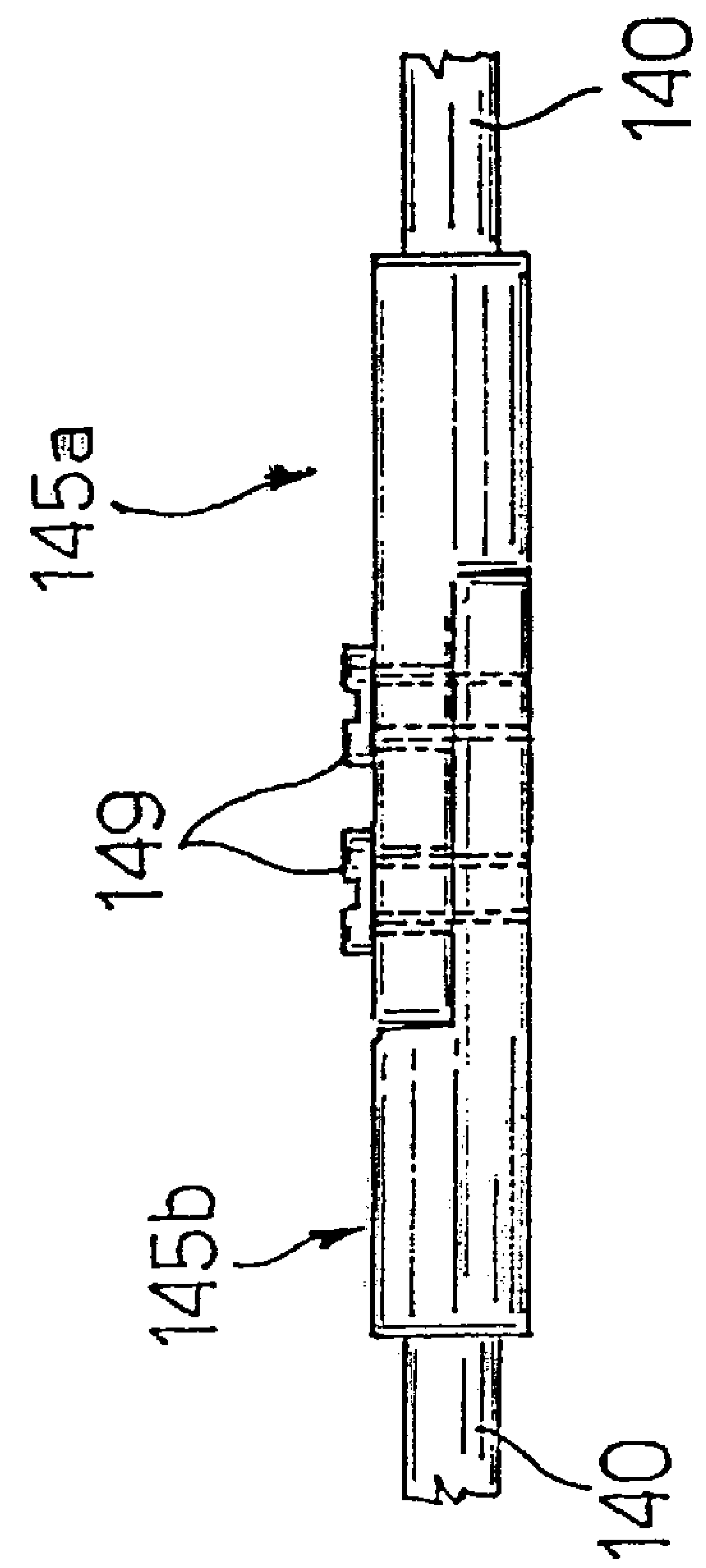

Fig.12

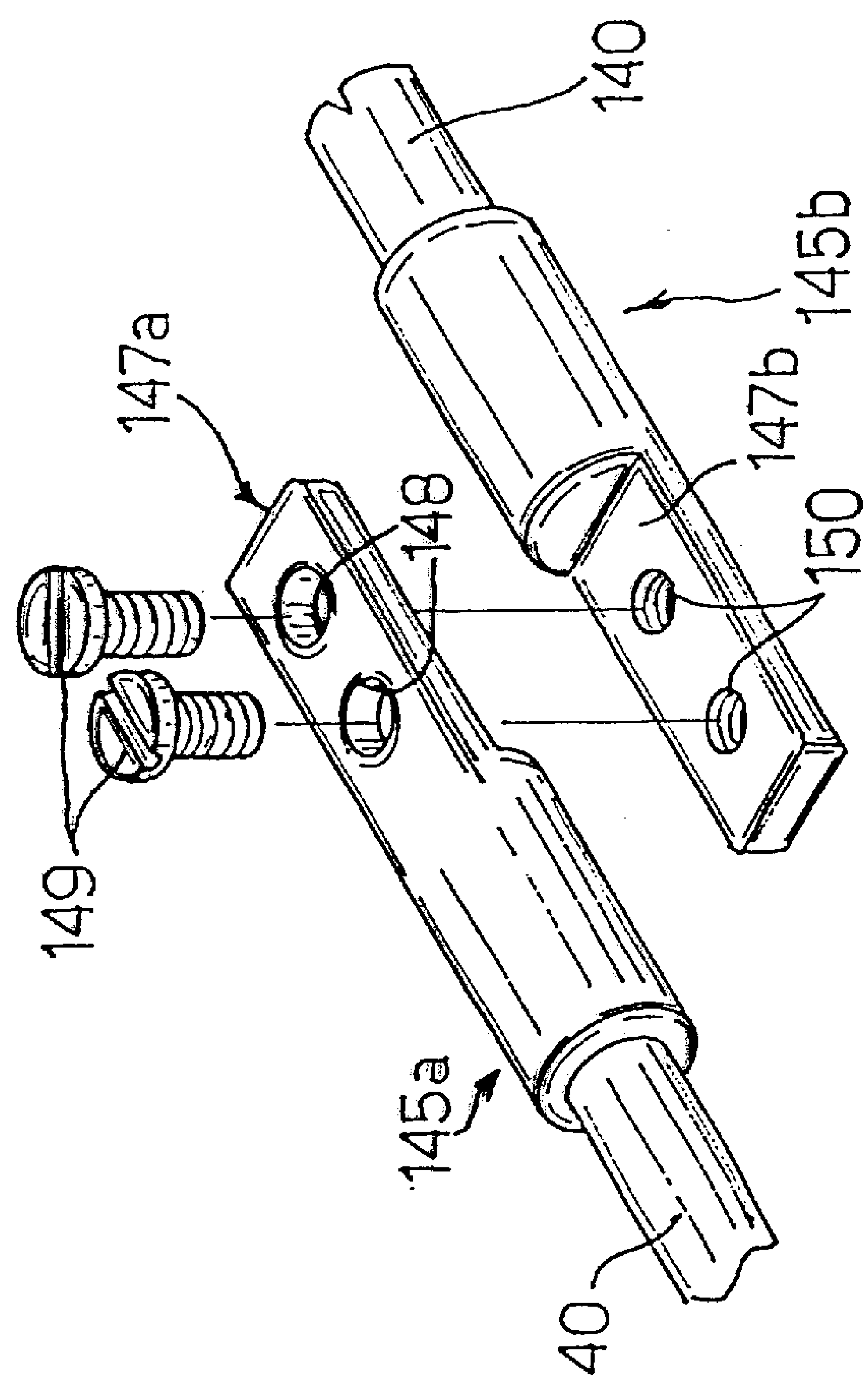

Fig.11

MODULAR POWER LINE FOR AN ELECTRIC VEHICLE

TECHNICAL FIELD

The present invention relates to a modular power line for an electric vehicle.

BACKGROUND ART

Power lines for electric vehicles—such as the one described in German Patent n°1.011.914 by Ludwig Reihardt, published on Jul. 11, 1957 —are known to comprise an elongated insulating enclosure closed at the top by a number of conducting plates aligned in a straight direction and insulated from one another. The enclosure houses an elastically deformable conducting strip element made of ferromagnetic material, and which is attracted by the magnetic field generated by electromagnets to flex a portion of the conducting strip element towards the conducting plates to electrically supply at least one.

French Patent n°1.151.382 by Jean-Florent DE BRUYN and Josè-Gaston DE BRUYN, published on Jan. 29, 1958, describes an electric vehicle current supply system comprising a hollow elongated insulating enclosure closed at the top by a number of conducting plates aligned in the traveling direction of the vehicle and separated by insulating elements interposed between adjacent conducting plates. The enclosure houses an elastically deformable conducting strip element extending in the traveling direction of the vehicle, and having a strip portion of ferromagnetic material on which is superimposed a strip portion of good electrically conducting material. The conducting element is attracted by the magnetic field generated by electromagnets on an electric vehicle to flex a portion of the conducting strip element towards the conducting plates to electrically supply at least one.

The power lines described in the above patents comprise a continuous conducting strip element extending the full length of the line, and which is practically impossible to produce, on account of the length of the line, and would anyway be extremely difficult to house inside the hollow enclosure. Moreover, such lines in no way provide for protecting the hollow enclosure, which is easily penetrated by external agents (such as water, vapour, dust, gas, etc.), which may damage the conducting strip element and electric contacts, or establish electric bridge connections between the conducting strip element and conducting plates.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide a power line designed to overcome the drawbacks of known lines, i.e. which comprises a number of elementary modules connectable to one another and each housing a strip element of finite length. It is a further object of the present invention to provide an elementary module defining a sealed inner cavity for housing the conducting strip element.

According to the present invention, there is provided a power line of the type described in claim **1**.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

FIG. **1** shows a longitudinal section of a power line for an electric vehicle in accordance with the teachings of the present invention;

FIG. **2** shows a cross section of the power line along line II—II in FIG. **1**;

FIG. **3** shows a cross section of the power line along line III—III in FIG. **1**;

FIG. **4** shows a cross section of the power line along line IV—IV in FIG. **1**;

FIG. **5** shows a view in perspective of a component module of the FIG. **1** power line;

FIGS. **6** and **7** show longitudinal sections of an end portion of the FIG. **5** module in two different operating positions;

FIG. **8** shows an exploded view in perspective of a detail of the FIG. **1** power line;

FIG. **9** shows a larger-scale cross section of the FIG. **8** detail FIG. **10** shows a schematic top plan view of a line in accordance the present invention;

FIG. **11** shows an exploded view in perspective of a second detail of a line in accordance with the present invention;

FIG. **12** shows a side view of the FIG. **11** detail.

BEST MODE FOR CARRYING OUT THE INVENTION

With reference to FIGS. **2**, **3** and **4**, number **1** indicates as a whole a modular power line for an electric vehicle.

Power line **1** comprises a number of elongated insulating enclosures (modules) **4**, each defining internally an elongated parallelepiped cavity **6** extending in a straight direction (along an axis) **8**.

More specifically, each enclosure **4** is formed in one piece, and comprises a bottom horizontal insulating wall **10**; two vertical lateral insulating walls **11**, **12** perpendicular to wall **10**; and a top horizontal insulating wall **15** parallel to and opposite bottom wall **10**.

Enclosure **4** houses a metal conducting enclosure **17** defining internally an elongated parallelepiped cavity **18** extending along axis **8**, and comprising a bottom wall **20** facing wall **10**, two vertical lateral walls **21**, **22** integral with and perpendicular to wall **20**, and a flat top metal wall **25** contacting and fitted to wall **15** by fastening devices (not shown).

Enclosure **17** houses a first electric power conducting line **27** comprising a straight metal conducting element housed in a top portion of cavity **18** and separated electrically from adjacent metal walls **21** and **25**. More specifically, conducting element **27** has a substantially L-shaped cross section, and comprises a flat horizontal first portion **27***a* adjacent and parallel to a flat insulating wall **30** underlying wall **25**, and a flat vertical second portion **27***c* perpendicular to and integral with portion **27***a* and supported on a vertical insulating wall **32** parallel and adjacent to metal vertical wall **21**.

Metal enclosure **17** defines a second electric power conducting line **23** extending substantially the whole length of insulating enclosure **4**.

With reference to FIGS. **2**, **3** and **4**, power line **1** comprises a number of rectangular metal plates **34** outside enclosures **4**.

More specifically, each plate **34** is fitted to top wall **15** via the interposition of a rubber sheet **36**, is connected to enclosure **4** by fastening devices (not shown), and extends beyond the width of wall **15** so that end portions project from enclosure **4**.

Power line **1** also comprises a number of insulating elements **37** (FIG. **1**) located outside enclosures **4** and interposed between plates **34**. More specifically, each insulating element **37** is interposed between and electrically separates two adjacent metal plates **34**. Each metal plate **34** communicates with a respective electric feeder device **40** housed inside cavity **18** and connected to plate **34** by a respective electric conductor **41** extending through insulating wall **30**, metal wall **25** (from which it is insulated) , wall **15** of enclosure **4**, and rubber sheet **36**.

Feeder **40** substantially comprises a C-shaped metal wall in turn comprising a flat horizontal first portion **45** supported on an insulating wall **47** superimposed on metal bottom wall **20**; a vertical second portion **49** facing and separated electrically from metal lateral wall **22** by an insulating wall **50**; and a flat horizontal third portion **51** perpendicular to and integral with vertical portion **49** and contacting insulating wall **30**.

Flat portions **51** and **45** are therefore parallel and face each other on opposite sides of cavity **18**; and portions **51** and **45** of the various feeder devices **40** are spaced along axis **8** and the full length of enclosure **4** to respectively define first and second electric collectors for the purpose explained later on.

Flat portion **45** (second collector) is coplanar with a portion **20***a* of the second electric power line; and flat portion **45** and portion **20***a* are separated electrically and have respective parallel facing edges **45***b* and **20***b* equidistant (distance h/2) from the plane of symmetry P, perpendicular to walls **10** and **15**, of enclosure **4**.

Flat portion **51** (first collector) is coplanar with portion **27***a* of the first electric power line; and flat portion **51** and portion **27***a* are separated electrically and have respective parallel facing edges **51***b* and **27***b* equidistant (distance d/2) from plane of symmetry P.

Feeder device **40** also cooperates with a conducting strip element **60**, which is housed inside cavity **18**, extends the full length of enclosure **4**, and, when in the rest position (FIG. **2**), is substantially perpendicular to and symmetrical with plane P. Conducting strip element **60** has opposite end portions **60***e* (FIGS. **5**, **6**, **7**) fitted to supporting and connecting devices **62** (described in detail later on) at opposite ends of enclosure **4**.

Strip element **60** comprises a central portion **63** defined by a strip of flexible insulating material supporting conducting portions on opposite sides of insulating strip **63**. More specifically, insulating strip **63** supports a flexible top conducting strip **65** made of ferromagnetic material and integral with and superimposed on strip **63**. Strip **65** faces wall **25** and is of a width L greater than the distance d between facing edges **51***b* and **27***b*.

Strip element **60** also comprises a bottom conducting portion defined by a metal strip **67** facing wall **20** and integral with central insulating strip **63**.

Metal strip **67** is of a width L greater than the distance h between facing edges **45***b* and **20***b*.

Each insulating enclosure **4** is provided, at two opposite end portions, with respective supporting and connecting devices **62**, each of which provides for supporting an end portion **60***e* of conducting strip element **60**, while at the same time permitting a substantially transverse movement of end portion **60***e* as explained later on.

Each device **62** comprises a rectangular elastically deformable accordionlike wall **100** having, in cross section, an undulated profile, and comprising an elastic peripheral lip **102**, which is fitted and secured firmly, e.g. by means of adhesive, to the peripheral end edges **4'** of elongated parallelepiped enclosure **4**.

Device **62** thus closes a respective end opening of enclosure **4** to prevent any external agents entering cavities **6** and **18**.

End portion **60***e* of conducting element **60** is defined by a rectangular end portion **65***e* of flexible top strip **65**, which rectangular end portion **65***e* projects from the ends of central insulating portion **63** and metal strip **67**, and is narrower than top strip **65**.

End portion **65***e* projects from metal enclosure **17** (FIGS. **6**, **7**), and is housed inside a pocket **105** defined by a hollow parallelepiped appendix extending outwards of enclosure **4** from wall **100** and open on the side facing cavities **6** and **18**. Pocket **105** is located approximately at a central portion of wall **100**, so that a first number of undulated portions **100***a* are located between pocket **105** and bottom wall **10**, and a second number of undulated portions **100***b* are located between pocket **105** and top wall **15**. Supporting and connecting device **62** also provides for connecting the conducting strip elements **60** of different insulating enclosures **4**; for which purpose (FIG. **7**), the end portions of insulating enclosures **4** are positioned facing each other, with parallelepiped appendixes **105** aligned and also positioned with end portions facing each other. Each parallelepiped appendix **105** (and the respective end portion **65***e* housed in it) is connected to the parallelepiped appendix **105** (and respective end portion **65***e* housed in it) of the other enclosure by means of a bridging device **110** for defining at least one restraint crosswise to direction **8**.

More specifically, bridging device **110** (FIGS. **8**, **9**) comprises a rectangular plate **115** with two rectangular wings **117** extending along the long sides of plate **115**; and a rectangular plate **120**, which is positioned facing and parallel to plate **115**, with its own long edges between wings **117**. Plate **115** also has a central hole **122** for housing the threaded shank **123***a* of a screw **123**, which screws into a threaded central hole **125** formed in plate **120**. Parallelepiped appendixes **105** are conveniently interposed between plates **115** and **120** and on opposite sides of screw **123**, which is screwed into hole **125** to bring plates **115** and **120** closer together, to compress parallelepiped appendixes **105** between the plates, and to connect end portions **65***e* housed in respective appendixes **105**.

In actual use, power line **1** is formed by aligning a number of enclosures **4** next to one another in a straight vehicle traveling direction; each pair of adjacent end portions **60***e* is connected mechanically, as described, using bridging device **110** to form an overall strip element extending the full length of line **1** and defined by the conducting strip elements **60** of the various connected enclosures **4**; and electric lines **27** and **23** of one enclosure are connected electrically to the corresponding electric lines of the adjacent enclosure by means of external connecting cables (shown in FIG. **10**).

More specifically, the end portions (not shown) of electric power line **27** are provided with respective lateral appendixes **141** (FIG. **2**) extending crosswise to axis **8** and through walls **32** and **21** of enclosure **17** and lateral wall **11** of enclosure **4**. Each appendix **141** is insulated electrically with respect to wall **21**, extends in fluidtight manner through lateral wall **11**, and defines, at the end outside enclosure **4**, a connecting terminal **142** from which extends a connecting cable **140**, the free end of which is fitted with an anchoring device **145***a*. Anchoring device **145***a* is connected mechanically and electrically to a similar anchoring device **145***b* on the end of an electric cable **140** extending from electric line **27** of another enclosure **4**, and conveniently comprises (FIGS. **11**, **12**) a cylindrical metal body connected to one end of cable **140** and in turn comprising a flat rectangular portion **147***a* with two through holes **148** for housing screws **149**, which screw into respective threaded holes **150** in a similar flat rectangular portion **147***b* of anchoring device **145***b* to establish electric and mechanical contact between flat portions **147***a* and **147***b*, and so electrically connect the electric power lines **27** of adjacent enclosures.

Similarly, metal enclosure **17** defining power line **23** is provided at each end with a metal lateral appendix **155**, which extends in fluidtight manner through enclosure **4** and has one end, outside enclosure **4**, connected to a connecting cable **160**, the free end of which is fitted with an anchoring device similar to devices **145***a*, **145***b*. Connection of the end portions of cables **160** electrically connects the electric power lines **23** of adjacent enclosures.

Power line **1** also comprises a device **180** (shown schematically in FIG. **10**) for controlling the fluidtight sealing of enclosures **4** of power line **1**, and which comprises a compressed gas generator/feeder **182** for filling the parallelepiped cavity **6** of a first enclosure **4** with inert gas (e.g. nitrogen). Line **1** also comprises a number of bypass pipes, each of which has opposite end portions communicating with respective inner cavities **6** of adjacent enclosures, so that the inner cavities **6** of the enclosures all communicate with one another to permit dispersion of the compressed inert gas along the whole of the line. Device **180** also comprises a pressure detector **190** connected to an enclosure **4** of the line, and which provides for detecting the pressure inside cavity **6** of the respective enclosure **4** to which it is connected, and for activating a fault indicating device **192** when the measured pressure falls below a given threshold value. More specifically, when enclosures **4** of the line are fluidtight, the measured pressure is above the threshold value; whereas, in the event of leakage from at least one of enclosures **4** (e.g. due to a pierced enclosure **4** or elastic wall **100**), the pressure inside line **1** falls, and the measured pressure falls below the threshold value to activate fault indicating device **192**.

Purely by way of example, line **1** may be laid between the rails (not shown) of a railroad line (not shown), with enclosures **4** housed inside a parallelepiped seat (FIGS. **2**–**4**) in the ballast (not shown). When so laid, plates **34** face upwards and are substantially coplanar with the rails (not shown). Power line **23** is conveniently connected to a ground potential, while power line **27** is connected to a positive supply potential.

Power line **1** is used in conjunction with an electric vehicle, for example, a railroad vehicle **80** (shown schematically in FIG. **1**) traveling along the railroad line (not shown). Line **1** may also be laid on a roadway (not shown), with enclosures **4** housed inside a parallelepiped seat formed in the roadbed (not shown), in which case, power line **1** is used in conjunction with a wheeled electric road vehicle (not shown) traveling along the road (not shown).

Electric vehicle **80** has a central portion defined by a floor **82** facing and parallel to plates **34**, and comprises, internally, a pair of electromagnets (or permanent magnets) **84** for generating a magnetic field from floor **82** towards enclosures **4**.

When power line **1** is not engaged by electric vehicle **80**, conducting element **60** is in a rest position (FIG. **2**) in which it is substantially undeformed and parallel to bottom wall **20**. More specifically, in the rest position, conducting strip **67** is substantially parallel to bottom wall **20** and rests, along the whole length of each enclosure **4**, on portion **20***a* of power line **23** and on flat portions **45** of the various feeder devices **40**, so that an electric connection is established between flat portions **45** and bottom wall **20**, and therefore between all the feeder devices **40** (and plates **34**) and power line **23**.

When conducting strip element **60** is in the rest position, plates **34** are therefore all connected to ground potential. Line **1** is therefore intrinsically insulated, in that all the outer parts (plates **34**) are at ground potential, and the live parts (lines **27**) are housed inside insulating enclosures **4** (high degree of insulation of line **1**) and inside metal enclosures **17** (high degree of shielding of line **1**). In the rest position, (positive) electric power line **27** is in fact insulated from all the other metal parts of line **1** and housed inside metal enclosure **17**. In particular, line **27** is insulated and separated physically from portion **51** (first collector).

When power line **1** is engaged by electric vehicle **80** and electromagnets **84** are active, a magnetic force of attraction is generated by the interaction between the field of electromagnets **84** and ferromagnetic conducting portion **65**, so that conducting element **60** is drawn and flexed upwards towards electromagnets **84**. As shown clearly in FIGS. **1**, **3** and **4**, the portion **60***a* of conducting strip element **60** affected by the force of attraction is drawn upwards into the shape of an arc towards wall **25**. More specifically, portion **60***a* of conducting element **60** beneath electromagnets **84** (and therefore subjected to a strong force of attraction) moves into an activated position parallel and adjacent to insulating wall **30** (FIGS. **1** and **4**) and with strip **65** contacting portion **27***a* of first power line **27** and at least one first collector **51**. An electric connection is thus established, via strip **65**, between first power line **27** and first collector **51**, and therefore between line **27** and a plate **34**. In the FIG. **1** embodiment, the shape and arrangement of electromagnets **84** are such that strip **65** contacts first collectors **51** of two adjacent feeder devices **40**, so that two adjacent (live) plates **34** are connected to positive power line **27**. Electric vehicle **80** comprises at least a first pickup device **87** (FIG. **1**) located beneath floor **82**, near electromagnets **84**, to mate with live plates **34** and supply positive electric power to run electric vehicle **80**.

The portions of conducting strip element **60** adjacent to portion **60***a* are inclined with respect to portion **60***a* and slant downwards by force of gravity towards wall **10**. The inclined portions **60***l* are spaced and physically separated from first collector **51** and second collector **45** (FIG. **3**), and are also spaced and separated from first power line **27** and second power line **23** (FIG. **3**).

Inclined portions **60***l* end when conducting strip element **60** comes to rest on bottom wall **20** of second conducting line **23** and on second collectors **45** of feeder devices **40**, so that all the plates **34** of line **1** which are not live are connected to conducting line **23**.

Electric vehicle **80** also comprises at least a second pickup device **88** (FIG. **1**) located beneath floor **82**, behind/in front of electromagnets **84** in the traveling direction of the electric vehicle. Pickup device **88** mates with a plate **34** connected to line **23**, and supplies negative electric power by which to run electric vehicle **80**. Alternatively, pickup device **88** may mate with an external negative power line defined by a straight electric conductor (not shown) extending parallel to plates **34** and for supplying negative electric power by which to run electric vehicle **80**.

As electric vehicle **80** travels along, successive portions of strip element **60** are deformed, and portion **60***a*, following the motion of the electric vehicle, moves along the various enclosures **4** forming part of line **1**, so that the arced portion **60***a* of conducting strip element **60** travels wavelike along line **1**, from one end to the other of each enclosure **4**, and, on reaching the end portion of one enclosure **4**, moves to the end portion of the adjacent enclosure **4**.

Bridging device **110** provides for rigidly connecting the opposite end portions **60***e* of conducting strip elements **60** in adjacent enclosures **4** of modular line **1**, so that, as the arced portion **60***a* of strip element **60** reaches the end portion of one enclosure **4**, the end portion of the strip element of the next enclosure **4** is automatically flexed upwards, and the arced portion travels wavelike along the adjacent enclosures **4**.

The movement of end portion **60***e* is made possible by the particular design of supporting and connecting device **62**. More specifically, when the end portion is in the rest position (FIG. **7**), the end portions **60***e* housed in adjacent enclosures **4** are horizontal, with metal strip **67** bridging flat portion **45** and bottom wall **20**, so that portions **100***a*, **100***b* are substantially undeformed. The upward movement of end portion **60***e* is made possible by the elastic deformation of wall **100**. That is, as end portion **60***e* is raised, undulated portions **100***a* and **100***b* are stretched and compressed respectively in a direction perpendicular to axis **8**; and undulated portions **100***a* (stretched) exert downward pull on end portion **60***e* to assist the return downward movement of portion **60***e* when the magnetic force of attraction is extinguished. When end portion **60***e* is restored to the lowered rest position, portions **100***a*, **100***b* reassume their original undeformed position.

According to the present invention, adjacent enclosures **4** are connected to form a modular power line, i.e. defined by a number of strip elements of finite length; connection of the adjacent enclosures is straightforward and effective, to ensure the mechanical continuity of the strip element of modular line **1**; and gas, water, dust or any other external agents are prevented from penetrating cavities **6** and **18**, which are therefore completely airtight.

Moreover, line **1** is also so designed that all the external conducting parts (plates **34**) of power line **1** are normally connected to ground potential (power conducting line **23**) when line **1** is not engaged by the electric vehicle. Plates **34** are only connected to power line **27** (e.g. to a positive supply potential) when power line **1** is engaged by electric vehicle **80**; and, what is more, the live plates **34** are located underneath the electric vehicle and therefore inaccessible.

Power line **1** is therefore intrinsically extremely safe (having no permanently live parts) and may even be located in places accessible to vehicle users and personnel.

Moreover, line **1** provides for continually controlling the sealing of cavities **6** of insulating enclosures **4**.

What is claimed is:

1. A modular power line for an electric vehicle, comprising:

a number of conducting elements (**34**) arranged in a traveling direction (**8**) of the electric vehicle (**80**) and separated electrically from one another;

at least a first conducting line (**27**) supplied with a first polarity;

a trip (**60**) extending in said traveling direction (**8**) along substantially the whole length of the power line;

enclosure means (**4**) for housing said strip (**60**);

said strip (**60**) being elastically deformable, and comprising at least one portion made of ferromagnetic material (**65**); said portion made of ferromagnetic material (**65**) interacting with a magnetic field generated by excitation means (**84**) carried by said electric vehicle (**80**) to attract at least one portion (**60***a*) of said strip (**60**) into a contact position in which an electric connection (**51**, **65**, **27**) is established between said first conducting line (**27**) and at least one said conducting element (**34**);

characterized in that said enclosure means comprise a number of separate enclosures (**4**), each defining a respective elongated inner cavity (**6**, **18**) housing a strip element of finite length of said strip (**60**); each end of each said enclosure (**4**) having a respective supporting and connecting device (**62**) for supporting an end portion (**60***e*) of said strip element of finite length, and for permitting movement of said end portion (**60***e*) with respect to the enclosure (**4**); said supporting and connecting device (**62**) also connecting to an adjacent end portion (**60***e*) of an adjacent trip element of a finite length of said strip (**60**) housed in an adjacent one of said enclosures, and permitting movement of said adjacent end portion (**60***e*).

2. A power line as claimed in claim **1**, characterized in that said supporting and connecting devices (**62**) also provide for fluidtight sealing said inner cavity (**6**, **18**).

3. A power line as claimed in claim **1**, characterized in that the supporting and connecting device (**62**) comprises at least an elastically deformable wall (**100**) located at said end of said enclosure (**4**) and supporting (**105**) said end portion (**60***e*) of said strip element; a deformation of said wall (**100**) permitting said movement of said end portion (**60***e*) with respect to said enclosure (**4**).

4. A power line as claimed in claim **3**, characterized in that said elastically deformable wall comprises an elastic accordionlike wall having, in cross section, an undulated profile, and having a peripheral portion (**102**) connected in sealed manner to said enclosure (**4**); said accordionlike wall having pocket means (**105**) for housing said end portion (**60***e*) of said strip element.

5. A power line as claimed in claim **4**, characterized in that said pocket means (**105**) comprise a hollow parallelepiped appendix extending outwards of the enclosure (**4**) from said deformable wall (**100**) and open on a side facing said cavity (**6**, **18**).

6. A power line as claimed in claim **4**, characterized in that said pocket means (**105**) are located approximately at a central portion of said deformable wall (**100**).

7. A power line as claimed in claim **6**, characterized in that the supporting and connecting devices (**62**) also comprise bridging means (**110**) which are interposed between adjacent end portions (**60***e*) of adjacent strip elements of said strip (**60**) and define, for said adjacent end portions (**60***e*), at least one restraint crosswise to said traveling direction (**8**).

8. A power line as claimed in claim **7**, characterized in that said bridging means (**110**) are interposed between said adjacent end portions (**60***e*); each said adjacent end portion (**60***e*) being contained at least partly in said wall (**100**).

9. A power line as claimed in claim **7**, characterized in that said bridging means (**110**) are interposed between said pocket means (**105**) housing said adjacent end portions (**60***e*).

10. A power line as claimed in claim **7**, characterized in that said bridging means comprise at least first (**115**) and second (**120**) plate bodies, and relative-position regulating means (**123**) interposed between said first (**115**) and second (**120**) plate bodies; said adjacent end portions (**60***e*) being housed firmly between said first (**115**) and second (**120**) plate bodies.

11. A power line as claimed in claim **10**, characterized in that said conducting elements (**34**) comprise plates electrically separated from one another and carried by said enclosure means (**4**).

12. A power line as claimed in claim **11**, characterized in that each said conducting element (**34**) communicates electrically (**41**) with first collector means (**51**) and second collector means (**45**) housed in said cavity (**6, 18**);

said cavity (**6, 18**) also housing said first conducting line (**27**) and a second conducting line (**23**) separated from the first conducting line (**27**);

said strip element establishing an electric contact between said second conducting line (**23**) and said second collector means (**45**) during the portions of said strip element (**60**) in a rest position in which the strip element (**60**) is elastically undeformed and rests on said second collector means (**45**) and on said second conducting line (**23**); and said strip element (**60**) establishing an electric contact between said first conducting line (**27**) and said first collector means (**51**) during the portions of said strip element (**60**) in said contact position.

13. A power line as claimed in claim **12**, characterized in that said first collector means (**51**) and said second collector means (**45**) comprise flat conducting portions housed in said cavity (**6, 18**) and facing each other on opposite sides of the cavity (**6, 18**);

said first conducting line (**27**) and said second conducting line (**23**) comprising respective flat elongated conducting portions (**27***a*, **20***a*) housed facing each other inside said cavity (**6, 18**) and extending substantially the whole length of said enclosure (**4**);

said strip element comprising:

striplike insulating means (**63**) extending substantially the whole length of said enclosure (**4**) and between said supporting and connecting devices (**62**);

said ferromagnetic material carried on a first side of said striplike insulating means (**63**) and facing said first collector means (**51**) and said first conducting line (**27**);

at least one second conducting element (**67**) carried on a second side of said striplike insulating means (**63**) and facing said second collector means (**45**) and said second conducting line (**23**);

said second conducting element (**67**) establishing an electric bridge connection between said second conducting line (**23**) and said second collector means (**45**) during the portions of said strip element (**60**) in said rest position; and

said ferromagnetic material establishing an electric bridge connection between said first conducting line (**27**) and said first collector means (**51**) during the portions of said strip element (**60**) in said contact position.

14. A power line as claimed in claim **13**, characterized in that said first conducting line (**27**) comprises a contact portion (**27***a*) substantially coplanar with a contact portion (**51**) of said first collector means (**51**);

said first conducting elements (**65**) being of a width (L) greater than a distance (d) between adjacent edges (**51***b*, **27***b*) of said contact portions of said first collector means (**51**) and said first conducting line (**27**);

said ferromagnetic material being interposed, during the portions of said strip element in said contact position, between said contact portion of the first collector means (**51**) and the contact portion of the first conducting line (**27**).

15. A power line as claimed in claim **13**, characterized in that said second conducting line (**23**) comprises a contact portion (**20***a*) substantially coplanar with a contact portion (**45**) of said second collector means;

said second conducting element (**67**) being of a width (L) greater than a distance (h) between adjacent edges (**45***b*, **20***b*) of said contact portions of said second collector means (**45**) and said second conducting line (**23**);

said second conducting element (**67**) being interposed, during the portions of said strip element in said rest position, between said contact portion of the second collector means (**45**) and said contact portion (**20***a*) of the second conducting line (**23**).

16. A power line as claimed in claim **15**, characterized in that each said enclosure comprises electric interconnecting means (**140, 141, 142, 145***a*, **145***b*) communicating electrically (**141**) with said first conducting line (**27**) and extending in fluidtight manner through said enclosure; said electric interconnecting means (**140, 141, 142, 145***a*, **145***b*) having at least one connecting terminal (**142**) outside said enclosure and said connecting terminal is connected electrically (**140, 145***a*, **145***b*) to a similar terminal (**142**) forming part of another one of said enclosures (**4**) and said electric interconnecting means communicating with portions of said first conducting line of different enclosures (**4**).

17. A power line as claimed in claim **16**, characterized by comprising test means (**180**) for controlling fluidtight sealing of the enclosures (**4**); said test means (**180**) comprising:

compressed gas supply means (**182**) for feeding inert gas into the cavity (**6**) of at least one said enclosure (**4**);

bypass means (**185**) interposed between said cavities (**6**) of the enclosures; and

pressure detecting means (**190**) connected to said enclosure (**4**) to detect a pressure inside at least one said enclosure (**4**), and to generate a fault signal (**192**) when a measured pressure falls below a threshold value.

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